

What is Claimed Is:

1. A method of x-ray imaging, said method comprising the steps of:

5 illuminating a target with an area x-ray source using Hadamard transform mask patterns, creating reflected backscatter x-ray signals;

detecting said backscatter x-ray signals; and

conducting an inverse Hadamard transform utilizing  
10 said backscatter signals to form an image of said target.

2. A method of x-ray imaging, said method comprising the steps of:

illuminating a target with an area x-ray source  
15 using pairs of Hadamard transform patterns, each pair comprising alternating mask patterns;

recording the total backscatter signal for each mask of each pair of masks;

performing an inverse Hadamard transform using the  
20 difference in backscatter signal strengths of the alternating masks in each pair of masks; and

forming an image of the target from said inverse Hadamard transform.

25 3. A method of x-ray imaging, said method comprising the steps of:

directing a collimated laser beam, after having been acted upon by an addressable, spatial modulator, matrix mask, to a photo-cathode to generate a spatially modulated electron  
30 flux at the surface of the photocathode;

accelerating said electron flux from said photo-cathode to an anode, producing at said anode an x-ray source

pattern in accordance with the mask pattern at said spatial modulator mask;

beaming x-ray emissions from said anode through a pinhole onto a target to illuminate said target with multiple x-ray beamlets, said beamlets impinging on said target creating reflected backscatter x-ray signals;

detecting said backscatter x-ray signals;

modulating said spatial modulator matrix mask using pairs of transform patterns, each pair comprising alternating mask patterns;

recording the total backscatter signal for each mask of each pair of masks;

performing an inverse Hadamard transform using the difference in backscatter signal strengths of the alternating masks in each pair of masks; and

forming an image of the target from said inverse Hadamard transform.

4. A method of x-ray imaging, said method comprising the steps of:

directing a collimated laser beam toward an addressable, spatial modulator, matrix mask;

producing an x-ray source pattern in accordance with the mask pattern at said spatial modulator mask;

beaming x-ray emissions from said x-ray source pattern to illuminate a target with multiple x-ray beamlets, said beamlets impinging upon said target creating reflected backscatter x-ray signals;

detecting said backscatter x-ray signals;

modulating said spatial modulator matrix mask using pairs of Hadamard transform patterns, each pair comprising alternating mask patterns;

performing an inverse Hadamard transform from said backscatter signals; and

forming an image of the target utilizing said inverse Hadamard transform.

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5. The method of Claim 4 further comprising the steps of:

recording the total backscatter signal for each mask of each pair of masks;

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performing an inverse Hadamard transform using the difference in backscatter signal strengths of the alternating masks in each pair of masks; and

forming an image of the target from said inverse Hadamard transform.

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6. An apparatus for x-ray imaging, said apparatus comprising:

an area x-ray source for illuminating a target with x-ray patterns defined by Hadamard transform mask patterns,

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thereby creating reflected backscatter x-ray signals from said target;

a detector for detecting said backscatter x-ray signals; and

a display for displaying an image of said target,

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said image formed from an inverse Hadamard transform utilizing said backscatter signals.

7. The apparatus of Claim 6 wherein said x-ray source illuminates the target using pairs of Hadamard transform

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patterns, each pair comprising alternating mask patterns, said apparatus further comprising a recorder for recording the total backscatter signal for each mask of each pair of masks,

and wherein said image of the target is formed from an inverse Hadamard transform using the difference in backscatter signal strengths of the alternating masks in each pair of masks.

5           8.    An apparatus for x-ray imaging, said apparatus comprising:

          a source of collimated laser beams;           ✓

          an addressable, spatial modulator, matrix mask, said laser beam source directing said collimated laser beams toward  
10   said matrix mask;

          x-ray source patterns producing x-ray emissions in accordance with mask patterns at said matrix mask to illuminate a target with multiple x-ray beamlets, the impingement of said beamlets upon said target creating  
15   reflected backscatter x-ray signals;

          a detector for detecting said backscatter x-ray signals;

          a modulator for modulating said matrix mask using pairs of Hadamard transform patterns, each pair comprising  
20   alternating mask patterns; and

          a display for displaying an image of said target, said image created by performing an inverse Hadamard transform from said backscatter signals.

25           9.    The apparatus of Claim 8 further comprising:

          a recorder for recording the total backscatter signal for each mask of each pair of masks;

          said image of said target being formed by performing an inverse Hadamard transform using the difference in  
30   backscatter signal strengths of the alternating masks in each pair of masks.

10. An apparatus for x-ray imaging, said apparatus comprising:

a collimated laser beam source;

an addressable, spatial modulator, matrix mask, said  
5 laser beam source directing collimated laser beams toward said matrix mask;

a photo-cathode receiving laser beams from said matrix mask;

an anode for receiving accelerated electrons from  
10 said photo-cathode and for transmitting x-ray beams to a target thereby illuminating said target and creating reflected backscatter x-ray signals from said target;

a detector for detecting said backscatter x-ray signals;

15 a modulator for modulating said matrix mask using pairs of transform patterns, each pair comprising alternating mask patterns;

a recorder for recording the total backscatter signal for each mask of each pair of masks; and

20 a display for displaying an image of said target, said image formed by performing an inverse Hadamard transform using the difference in backscatter signal strengths of the alternating masks in each pair of masks.

25 11. A method of imaging, said method comprising the steps of:

illuminating a target with an area illumination source using Hadamard transform mask patterns, creating reflected backscatter signals;

30 detecting said backscatter signals; and

conducting an inverse Hadamard transform utilizing said backscatter signals to form an image of said target.

12. A method of imaging, said method comprising the steps of:

illuminating a target with an area illumination source using pairs of Hadamard transform patterns, each pair comprising alternating mask patterns, to produce backscatter signals from said target;

recording the total backscatter signal for each mask of each pair of masks;

performing an inverse Hadamard transform using the difference in backscatter signal strengths of the alternating masks in each pair of masks; and

forming an image of the target from said inverse Hadamard transform.

13. A method of x-ray imaging, said method comprising the steps of:

directing illumination rays toward an addressable, spatial modulator, matrix mask;

producing an x-ray source pattern in accordance with the mask pattern at said spatial modulator mask;

beaming emissions from said x-ray source pattern to illuminate a target creating reflected backscatter signals;

detecting said backscatter signals;

modulating said spatial modulator matrix mask using pairs of Hadamard transform patterns, each pair comprising alternating mask patterns;

performing an inverse Hadamard transform from said backscatter signals; and

forming an image of the target utilizing said inverse Hadamard transform.

14. The method of Claim 13 further comprising the steps of:

recording the total backscatter signal for each mask of each pair of masks;

5 performing an inverse Hadamard transform using the difference in backscatter signal strengths of the alternating masks in each pair of masks; and

forming an image of the target from said inverse Hadamard transform.

10 15. An apparatus for imaging, said apparatus comprising:

an area illumination source for illuminating a target with beams emissions defined in accordance with Hadamard transform mask patterns, said beams emissions

15 creating reflected backscatter signals from said target;

a detector for detecting the backscatter signals, and

a display for displaying an image of said target, said image formed from an inverse Hadamard transform utilizing said backscatter signals.

20 16. The apparatus of Claim 15 wherein said source illuminates the target using pairs of Hadamard transform patterns, each pair comprising alternating mask patterns, said apparatus further comprising a recorder for recording the  
25 total backscatter signal for each mask of each pair of masks, and wherein said image of the target is formed from an inverse Hadamard transform using the difference in backscatter signal strengths of the alternating masks in each pair of masks.

30 17. An apparatus for imaging, said apparatus comprising:  
a source of beams;

an addressable, spatial modulator, matrix mask, said beam source directing said beams toward said matrix mask;

a source pattern produced in accordance with a mask pattern at said matrix mask, said source pattern generating  
5 emissions to illuminate a target thereby creating reflected backscatter signals;

a detector for detecting said backscatter signals;

a modulator for modulating said matrix mask using pairs of Hadamard transform patterns, each pair comprising  
10 alternating mask patterns; and

a display for displaying an image of said target, said image created by performing an inverse Hadamard transform from said backscatter signals.

15 18. The apparatus of Claim 8 further comprising:

a recorder for recording the total backscatter signal for each mask of each pair of masks;

said image of said target being formed by performing an inverse Hadamard transform using the difference in  
20 backscatter signal strengths of the alternating masks in each pair of masks.